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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,502	09/10/2001	Mats Danielsson	GPD0020-US	7905

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EXAMINER	
GAGLIARDI, ALBERT J	
ART UNIT	**PAPER NUMBER**
2878	

DATE MAILED: 02/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/682,502	DANIELSSON, MATS	
	Examiner	Art Unit	
	Albert J. Gagliardi	2878	

-- Th MAILING DATE of this communication app ars on the cov r she t with th corr spond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Comment on Submissions

1. The response filed 12 December 2003 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-7 and 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nelson (US 4,937,453) in view of Fröjd (US 5,744,806), Iwanczyk (US 5,227,635) and Nygren (US 5,434,417).

Regarding claim 1, *Nelson* discloses an apparatus suggesting a method of detecting x-rays for obtaining improved radiographic images comprising the steps of: orienting a semiconductor radiation detector having a height greater than its thickness (see generally Figs. 1, 4 and 6A), the detector comprising a substrate (10) and pixel sensors formed as strips (12); wherein the orientation step includes selecting an acute angle between a direction of the incident radiation such that the incident radiation mainly hits the side of the detector (col. 7, lines 7-11) and wherein substantially all of the radiation is dissipated within the detector (see col. 4, lines 12-16 for example); and arranging a collimator (42) substantially perpendicular to the incident radiation and spaced apart from the detector.

Nelson does not disclose the particular angle of orientation as being less than about ten degrees or that the collimator includes apertures excluding at least one section of the detector between at least one edge of the detector and at least one active sensor area.

Regarding the particular angle as being selected to be less than about 10 degrees, although *Nelson* does not disclose a particular angle, *Nelson* teaches that the particular angle can be chosen to be some angle θ from the horizontal such that the apparent thickness of the detector is increased (col. 7, lines 7-11). Those skilled in the art would appreciate that the apparent thickness would vary from a minimum value when the detector is oriented at a horizontal (i.e., at 90 degrees to the incident radiation) and increase to a maximum apparent thickness as the angle approaches zero degrees, with the particular angle between 0 and 90 degrees being a matter of routine design choice within the skill of a person of ordinary skill in the art depending on the needs of the particular application and the optimal apparent thickness desired.

Regarding the limitation of assuring achievement of x-ray energy detection efficiency ranging from approximately 90 percent to 85 percent, the examiner notes that such limitation is a functional limitation that suggests no additional structure and therefore does not further differentiate the apparatus from the apparatus as suggested by *Nelson*.

Note: Apparatus claims must be structurally distinguishable from the prior art. Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990). See MPEP 2114.

The examiner further notes that regardless of whether or not the limitation suggests any particular structure, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (*See In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Since the detection efficiency (i.e., stopping power) is a well known result effective variable which depends on the material comprising the detector, the apparent thickness of the detector and the energy of the impinging radiation, the choice of any particular detection efficiency would have been an obvious design choice within the skill of a person of ordinary skill in the art depending on the need of the particular application so as to allow for optimization of the system. The examiner further notes that in regards to a particular detection efficiency, it is well known that among other things, the choice of a particular deficiency depends on such factors as the desire to reduce radiation exposure to a patient or object being imaged while still allowing for lighter and cheaper (i.e., using less material) detectors. As such, the choice of a particular detection efficiency as well as a particular relative angle of incidence of the impinging radiation (i.e., apparent thickness) is further viewed as an obvious design choice within the skill of a person of ordinary skill in the art depending on the need of the particular application so as to allow for optimization of the system in order to decrease patient dose and reduce the costs of the detector.

Regarding the collimator including apertures excluding at least one section of the detector between at least one edge of the detector and at least one active sensor area from the incident radiation, although not specifically disclosed by *Nelson*, it is well known in the art to adjust the aperture size of a collimator such that the radiation beam matches the active area of the sensor (see for example *Fröjd* at col. 4, lines 27-38). *Fröjd* teaches that adjusting the beam size to match the active area of the detector reduces patient dose and improves image quality. *Iwanczyk*

(Fig. 1) further teaches that an arrangement of a collimator (21) such that the aperture excludes at least one section of the detector between the edge of the detector and the active area of the sensor area from incident radiation has the further advantage of improving the electric field distribution in the detector, reducing surface leakage current, lowering effective capacitance, and eliminating current injections (abstract). As such, it would have been obvious to a person of ordinary skill in the art to size the aperture such that it excludes at least one section of the detector between the edge of the detector and the active area of the sensor from the incident radiation in order to reduce the radiation dose and improve detector performance.

The examiner further notes that while *Nelson* shows only a single aperture, it is well known and considered as a functionally equivalent design choice depending on the needs of the particular application to utilize multiple sensors and a collimator including multiple apertures (see functionally equivalent alternative arrangements disclosed by *Nygren* at Figs. 4 and 5).

Regarding claim 2, the method suggested by *Nelson* as modified in view of *Fröjd*, *Iwanczyk*, and *Nygren*, suggests using a collimator including a collimator slot to prevent incident radiation from hitting the edge of the detector.

Regarding claim 3, the method suggested by *Nelson* as modified in view of *Fröjd*, *Iwanczyk*, and *Nygren*, suggests an apparatus for detecting x-rays comprising: an x-ray detector able to be oriented relative to the incident radiation (*Nelson* - Figs. 1, 4, 6A) comprising a plurality of semiconductor strips (12; col. 3, line 63-64) arranged on a substrate (10), electrical outputs (12) for each of the strips; and electrical connections (18) between the strips such that the electrical output corresponding to corresponding points in each of the strips is combined, a means (inherent and/or obvious) for orienting the x-ray detector relative to the incident radiation

at an acute angle between a direction of the incident radiation and a side of the detector (col. 7, lines 7-11), the detector of sufficient height such that substantially all of the incident radiation dissipates in the detector (see col. 4, lines 12-16 for example), the angle being about 3 degree to less than about 10 degrees (obvious design choice); a collimator (42) arranged substantially perpendicular to the incident radiation and spaced apart from the detector, apertures excluding at least one section of the detector between at least one edge of the detector and at least one active sensor area from the incident radiation (obvious modification).

Regarding the functional limitation of assuring achievement of x-ray energy detection efficiency ranging from approximately 90 percent to 85 percent, the examiner notes that such limitation is a functional limitation that suggests no further step other than that of orienting the detector to a particular angle. The examiner additionally note that even if the limitation did suggest an additional step, such step would have been a matter of obvious design choice (see explanation regarding claim 1 above).

Regarding claim 4, *Iwanczyk* further suggests the use of a guard ring (15) to sink leakage current (col. 1, lines 41-51) and therefore, allow for improved energy detector performance (col. 1, lines 52-54).

Regarding claim 6, *Nelson* as modified in view of *Fröjd*, *Iwanczyk*, and *Nygren*, suggests a collimator having a collimator slot to prevent incident radiation from hitting the edge of the detector.

Regarding claim 7, *Nygren* suggests a functionally equivalent arrangement including a plurality of detectors each having a collimator slot (see generally Fig. 5).

Regarding claim 9, *Nelson* discloses that detector is made of silicon (col. 3, line 58).

Regarding claim 10, *Nelson* discloses that the detector may utilize different materials (col. 6, lines 62-64). Particular materials such as gallium arsenide and CdZnTe are well known for use in radiation detectors and would have been an obvious design choice.

Regarding claim 11, absent some degree of criticality, the particular side of the detector exposed to the radiation is a matter of routine design choice depending on the particular needs of the application.

Regarding claim 12, *Nelson* discloses that the apparatus is used in scanned slot medical imaging (col. 1, lines 5-9). The examiner further notes that "use" limitations are not structural limitations (see not above).

Regarding claim 13, *Nelson* discloses that the apparatus is used in scanned slot medical imaging (col. 1, lines 5-9). Medical imaging applications such as mammography, bone densitometry, and non-destructive testing are well known and would have been an obvious design choice. The examiner further notes that "use" limitations are not structural limitations (see not above).

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Nelson*, *Fröjd*, *Iwanczyk* and *Nygren* as applied above, and further in view of Jahnke (DE 196 18 465).

Regarding claim 8, regarding the use on an absorber placed between detectors, it is well known in the art (see for example *Jahnke*) to include the use of an absorber (3) placed between adjacent detectors (1). Those skilled in the art appreciate that the use of such absorbers allow for better system performance by reducing cross-talk and scattered radiation between detectors. As such it would have been obvious to a person of ordinary skill in the art to modify the device disclosed by *Nelson* and *Iwanczyk* to include absorbers in order to improve system performance.

Response to Arguments

5. Applicant's arguments with respect to independent claims 1 and 3 have been considered they are not persuasive.

Regarding the recitation of the of the specific range of an acute off-set angle and a particular detection efficiency, such limitations have been discussed in the above rejections.

In regards to applicant's claim that a detection efficiency of 90 percent to 85 percent is an unexpected result, the examiner disagrees. As noted by *Nelson*, the expected result of orienting the detector at an acute angle is that the detection efficiency will be increased. *Nelson* teaches that the detection efficiency may in alternative arrangements be increased by either increasing the actual thickness of the detector arrangement by stacking detector (col. 6, 39-45) or by increasing the apparent thickness by orienting the detector at a desired angle (col. 7, lines 4-11). As such, contrary to applicant's assertion, an increased detection efficiency is not viewed as an unexpected result.

6. All of applicant's arguments having been addressed, the rejection is maintained.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert J. Gagliardi whose telephone number is (571) 272-2436. The examiner can normally be reached on Monday thru Friday from 9 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David P. Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Albert J. Gagliardi
Primary Examiner
Art Unit 2878

AJG